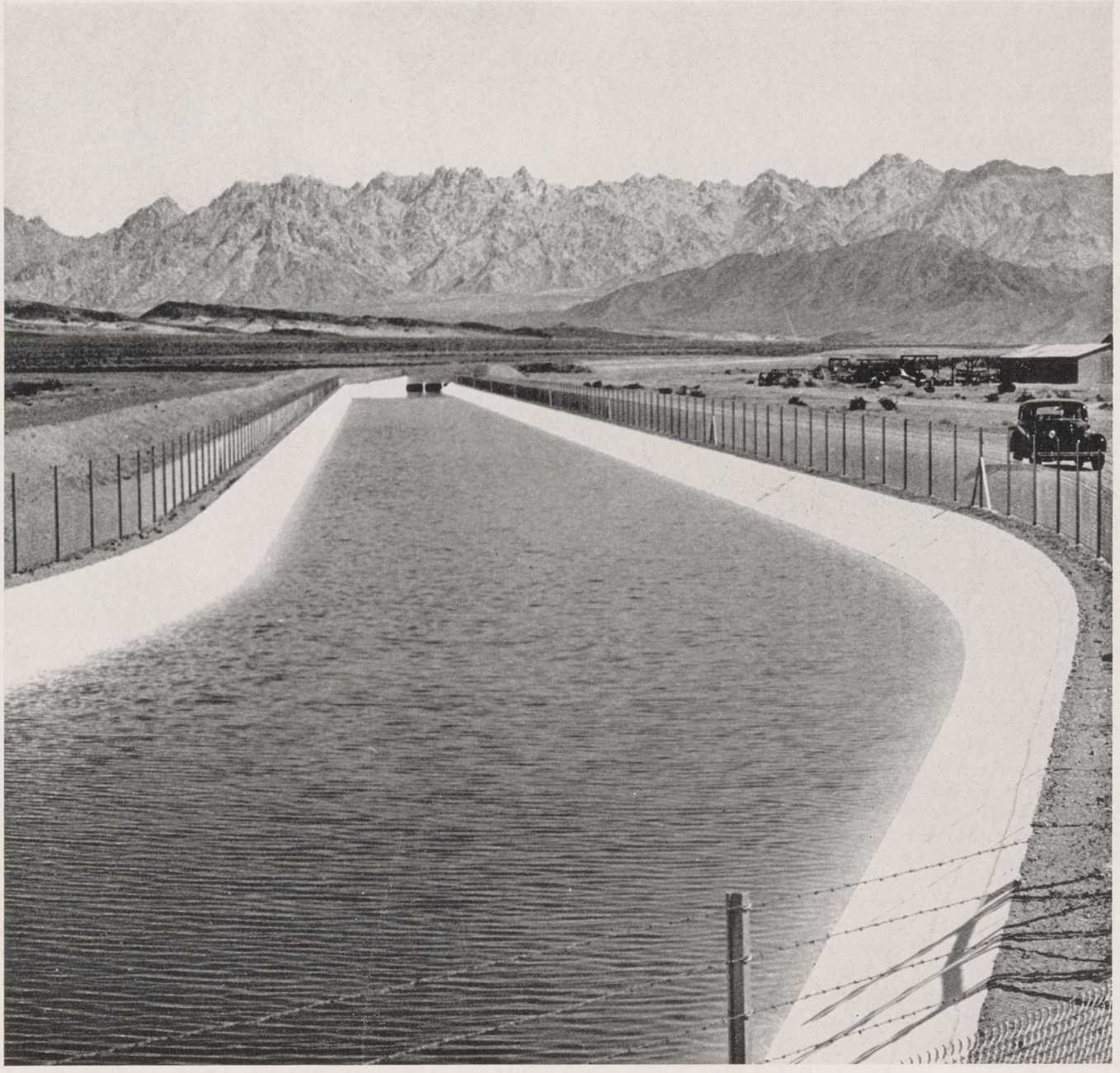
• COLORADO RIVER •

AQUEDUCT NEWS

THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

Vol. VI. APRIL 25, 1939 No. 4



IT'S ON THE WAY

An Aqueduct canal section in the Pinto Wash, about midway between the Coxcomb Tunnel and the Eagle Mountain Pumping Plant, filled with Colorado River Water.

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AQUEDUCT NEWS
THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

306 West Third St.
Los Angeles, California

Published monthly in the interest of Field and Office Workers on the Colorado River Aqueduct, and for the information of all other citizens of the Metropolitan Water District.

Vol. VI. April 25, 1939 No. 4

Water Flows Into Hayfield Reservoir On April 12

Slowly spreading out over an ancient desert dry lake bed, water from the Colorado River reached a point 125 aqueduct miles west of the Intake Pumping Plant on the evening of April 12, and began to fill the Hayfield Reservoir on the Metropolitan Aqueduct.

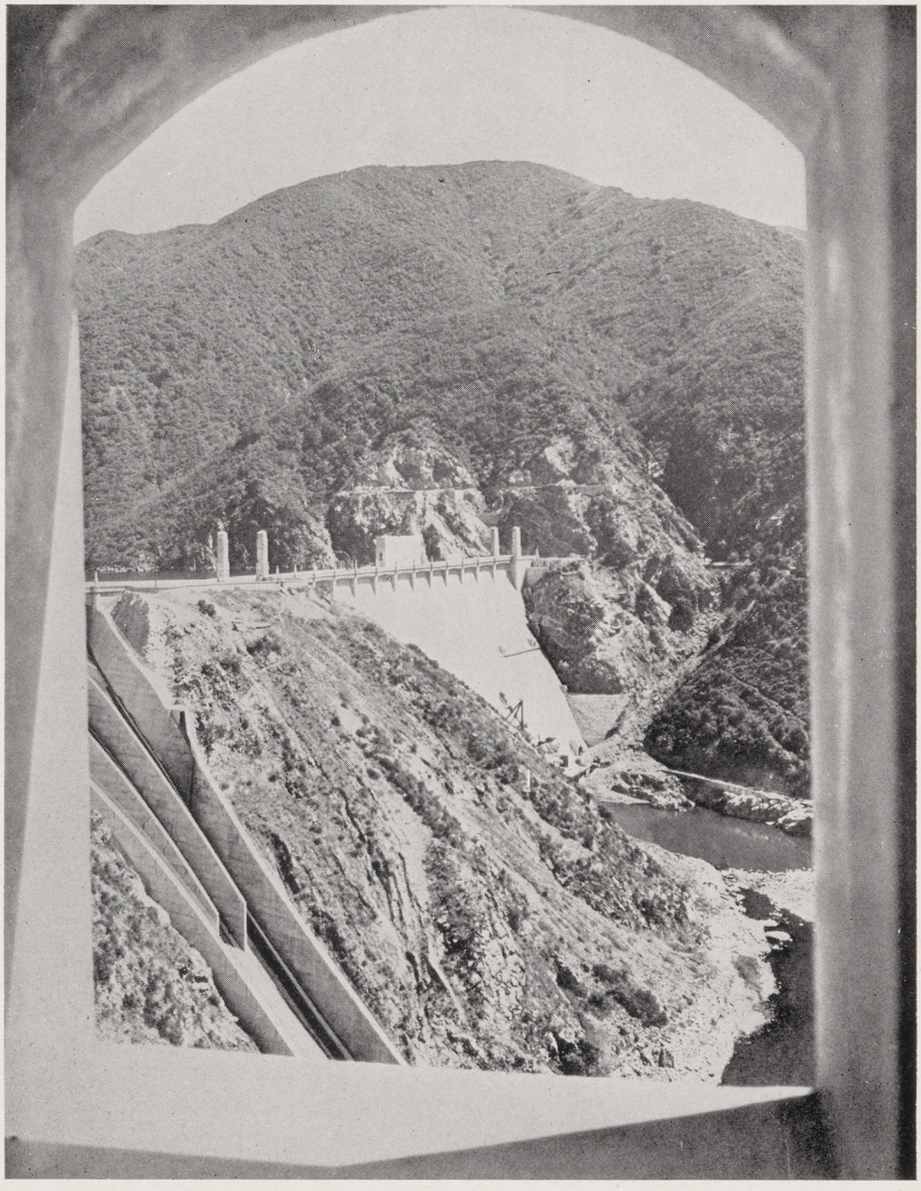
Early in April the outlet gates at the Copper Basin Reservoir were opened and the aqueduct water started its first long gravity sweep across the deserts to the Iron Mountain Pumping Plant, the third of the five plants which will lift water a total height of 1617 feet over mountain ranges that lie between the Colorado River and the coastal plain of Southern California.

On the morning of April 3, the motors were started at the Iron Mountain plant, and within the next 48 hours, the water was on its way again, boosted up the 144-foot lift at that point and then spilled down another gravity run for forty miles to the Eagle Mountain Pumping Plant.

Preliminary tests at Iron Mountain had been completed by April 6, and on April 10 the giant 12,500-horsepower motors at Eagle Mountain went into action to hoist the water an additional 438 feet. At the top of this lift aqueduct water had been raised a total of 1176 feet, and, allowing for the gravity drops in between, was 964 feet higher than its source in the lake back of Parker Dam.

Within the course of a few days, from the time it left the Copper Basin Reservoir until it reached Hayfield Reservoir, the moving head of that westward flowing stream of water had reached and checked off many of the points that were

(*Continued on Page* 10.)



A recent picture of Morris Dam in San Gabriel Canyon as framed by a small opening in the concrete railing of a nearby highway bridge.

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SUPERINTENDENTS OF CONSTRUCTION PUMPING PLANTS

Intake and Gene.....T. T. Walsh
Iron Mt.....B. H. Martin
Eagle Mt. and Hayfield.....G. E. Archibald

SUPERINTENDENTS

(Main Aqueduct Tunnels)

San Jacinto Tunnel, District Force Acct., B. C. Leadbetter, Gen. Supt.; C. E. Sides, Tunnel Supt.; Edwin Noon, Supt.; F. A. Backman, Gen. Foreman.

(Distribution Pipe Line)

Schedules 21SC, 22SC, 23SC, J. F. Shea Co., Gilbert J. Shea, Gen. Mgr.; W. F. Rennebohm, Supt.

Schedules 24SC, 25SC, Emsco Derrick & Equipment Co. F. O. Mjellem, Shop Supt.; Hans Gude, Field Supt.

Schedules 26SC, 27SC, 28C, Western Pipe and Steel Co. C. P. Sanders, Gen. Supt.; S. S. Walker, Field Supt.

Palos Verdes Reservoir, W. E. Hall Co.; W. E. Hall, Gen. Mgr.

San Gabriel Canyon Spillway: J. F. Shea Co., W. F. Rennebohm, Supt.

The first run of a motor and pump in an aqueduct plant is serious business. Note the intent expressions on the faces of these M.W.D. engineers as Chief Electrical Engineer Gaylord, center, starts the first motor at the Iron Mountain plant.

Interest Rates On District Bonds Reduced by R.F.C.

A further reduction of the interest rate on a large block of Colorado River Waterworks Bonds that will result in a saving of approximately $6,000,000 to the thirteen cities comprising The Metropolitan Water District of Southern California has been granted recently by the Reconstruction Finance Corporation, holders of the bonds.

Mr. Victor H. Rossetti, member of the Finance Committee of the District's Board of Directors, announced that this huge saving to the cities of the Water District was made possible largely through the efforts of R. F. C. Chairman Jesse H. Jones, who personally directed negotiations which resulted in the interest rate reduction.

Under the new agreement, the interest cost on a block of $73,444,000 in District bonds held by the R. F. C. has been reduced from 4¼ per cent to an average of 4 per cent. One block of these bonds will carry a 3½ per cent coupon rate, and the others will bear 4¼ per cent interest.

Mr. Rossetti pointed out that this reduction will mean a saving to the M. W. D. of $127,000 per year, or approximate-

(*Continued on Page* 6)

Series of Aqueduct Broadcasts Started By CBS On April 10

Beginning on Monday evening, April 10, the Columbia Broadcasting System, through its Western Division of Public Affairs, inaugurated a series of radio broadcasts which will bring to the general public scenes from the last jobs in building the Colorado River Aqueduct.

The first of these programs which are "on the spot" broadcasts, was from the San Jacinto tunnel, and the second program, which was released on Monday night, April 24, came from the Palos Verdes Reservoir on the distributing system.

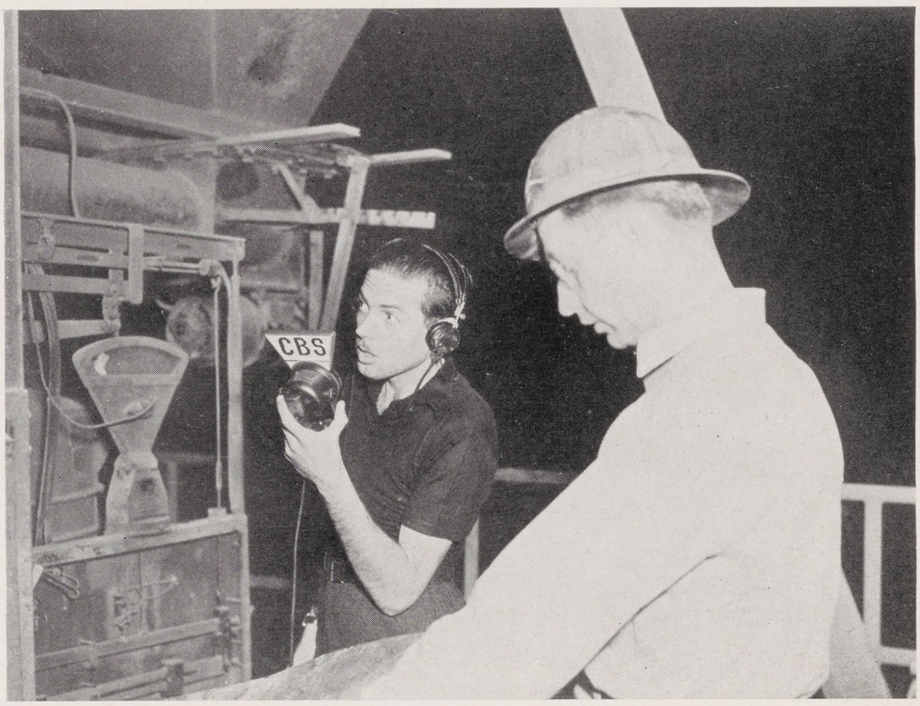
Present plans of the broadcasting system call for two of these programs each month during the balance of the spring, summer and early fall. Released in Southern California over radio station KNX, and carried by the Pacific Coast Network of the Columbia Broadcasting System, these broadcasts are to be on the air every other Monday night at 10:30 P. M., Pacific Coast Time.

The exact dates for all of the programs have not been announced as yet, but the next two broadcasts will be on May 8, and May 22. Dates of future programs will be announced in following issues of The Aqueduct News.

In announcing the first of this series of broadcasts, the Columbia Broadcasting System stated:

"This is the first of a series of programs that can never be repeated in all of the history of the world. Here on

(*Continued on Page* 7)



CBS program director Paul Pierce, with microphone, describes scene at San Jacinto tunnel batching plant on first of aqueduct radio broadcasts on April 10. Obstructing the foreground is aqueducker Harry Carmody.

RESERVOIRS

Problems Involved in Construction of Gene Wash and Copper Basin Reservoirs.

By W. E. WHITTIER
Formerly Division Engineer, Div. 1, M. W. D.

Gene Wash and Copper Basin reservoirs, located near the Colorado River, serve to regulate and equalize the discharges from the Intake and Gene pump lifts and to remove any small amount of silt that may result from local flood flows into Parker reservoir.

Preliminary topographic surveys of both reservoirs, including alternative dam sites, were completed in 1930 to a scale of 1 inch equals 1,000 feet. After more detailed study of possible locations for the two dams, additional topography was taken on a scale of 1 inch equals 20 feet to permit final fixing of the locations of the dams and to furnish data for arch analysis and calculation of contract quantities. This work, which was started November 2, 1936, and was completed December 8, 1936, proved extremely hazardous, due to the precipitous side walls of the canyons. It was necessary to erect a cable line across each canyon, from which men could be suspended on bosun's chairs to paint and number. The position and elevation of each of these points was then determined by cutting them in with transit set up at previously established points of control. The locations and elevations of the painted points were plotted to scale and five-foot contours sketched in.

The contract for the construction of the two dams and their appurtenant works was awarded to J. F. Shea Co., Inc., March 26, 1937, construction started March 29, 1937, and was completed August 15, 1938, with the exception of cooling the concrete and grouting the contraction joints of Copper Basin dam. This work was done by District forces after the return of cool weather.

At the time the contract was let there were no suitable construction roads to the various features of the work except the District highway from Earp, California, to Division No. 1, and the contractor was forced to undertake the widening and straightening of about 10 miles of old survey trails and prospectors' roads to facilitate the transportation of construction material and equipment.

At Gene Wash dam good rock was encountered at about 7 feet below the natural stream bed. The side wall abutments were stripped an average of 16 feet of rock normal to the original ground surface. At Copper Basin dam good rock was found at 23 feet below the natural stream bed. The side wall abutment stripping averaged about 20 feet.

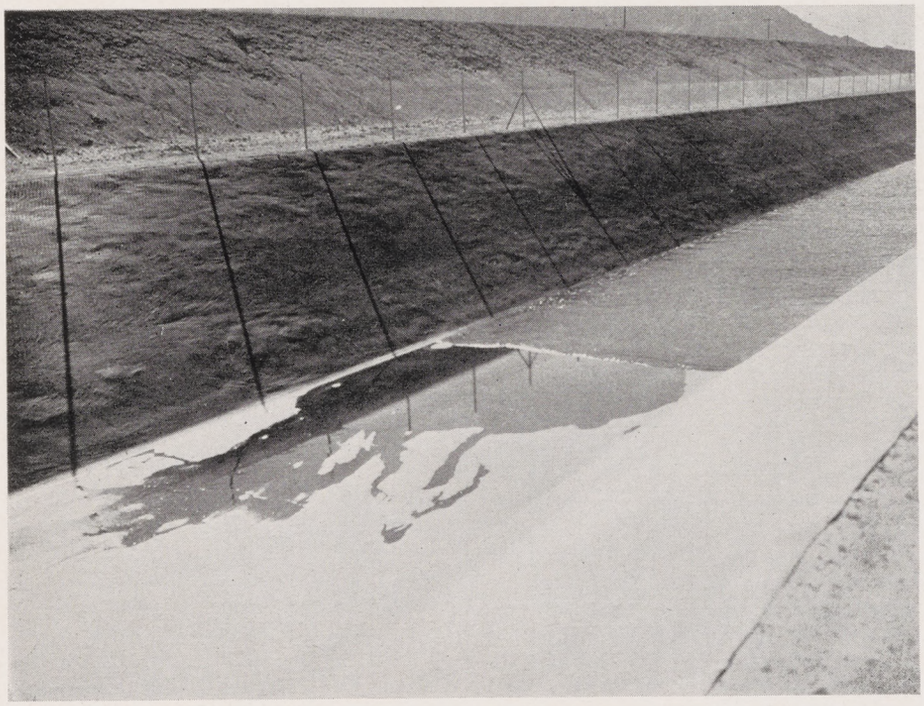
Mass concrete for the two thin arch dams and two spillways was started October 24, 1937, and completed April 29, 1938. Approximately 40,000 cubic yards was placed at an average rate of about 6,400 cubic yards per month. In each dam concrete was placed in vertical blocks about 50 feet in length along the axis of the dam. Vertical keyways were provided at the radial joints between blocks. Concrete in the blocks was generally placed in five-foot lifts, but some ten-foot lifts were placed in the Copper Basin dam. The top of each lift was cleaned with an air-water jet under a pressure sufficient to remove laitance at a time between the initial set and final set when the cement film can be washed clean from aggregate without damage to the surface. At first these horizontal construction joints were cured by being kept wet under heavy water-soaked burlap. This practice was later discontinued in favor of covering the top of the lift with a layer of wet sand about ½ of an inch in thickness. Wet sand was adopted in place of burlap in order to prevent the fine red-brown dust, produced by excavation of the red-brown country rock, from passing through the burlap and staining the surface of the concrete. The sand was a decided improvement over the burlap, as it prevented the undesirable red stain and kept the concrete surface more uniformly wet with less labor, and, in effect, gave the surface an additional clean-up when the sand blanket was removed.

Concrete aggregate was obtained at the Parker dam aggregate plant, located in the valley of Bill Williams River on the Arizona side of the Colorado River, hauled to the site where cement was added, mixed in a one-yard Rex paver at Gene Wash dam and a two-yard Rex stationary mixer at Copper Basin dam, and transported from the mixer to the point of placement in 2-cubic yard bottom dump buckets by high line cableways. The concrete was cooled to an average temperature of about 50 degrees Fahrenheit by pumping refrigerated water through 1-inch diameter thin-walled steel cooling coils located in a horizontal position at 5-foot vertical intervals throughout the mass. After the concrete had been cooled to the desired temperature, water under pressure was introduced into the contraction joints in order to separate the blocks slightly and allow free passage of the cement grout when applied. When all joints were known to be free, batches of approximately 2 cubic feet of cement grout, composed of 1 part of cement to 1 part water, were injected into all adjacent joints from the bottom of the dam upwards and from abutment to abutment in rotation, so that the level of the grout in joints was maintained at the same elevation at all times. As the grout entered the joints the pressure was gradually increased in the lower grout lifts as the upper lifts were being filled. The pressures were finally raised to about 65 pounds per square inch at the bottom of the dam and 25 pounds at the crest. These pressures were maintained for one hour, when grouting was considered complete. As some radial and axial deflection was expected in the dam as pressure grout was introduced into the contraction joints, arrangements were made to record even the slightest movements. The radial deflection was found to be zero and the axial deflection to be only one-hundredth of a foot.

GENERAL INFORMATION

Gene Wash and Copper Basin Dams and Appurtenant Works

DAMS	Gene Wash	Copper Basin
Type	Concrete Arch	Concrete Arch
Height—above streambed	131 ft.	187 ft.
Height—above bedrock	138 ft.	210 ft.
Length at crest	430 ft.	254 ft.
Width of base at streambed	26.5 ft.	35 ft.
Width of crest	5 ft.	5 ft.
Elevation of crest	746	1038
Volume of excavation	9,061 cu. yds.	11,685 cu. yds.
Volume of mass concrete	14,134 cu. yds.	17,012 cu. yds.
Volume of structural concrete	283 cu. yds.	326 cu. yds.
OUTLET WORKS		
3—10-ft. Regulating Slide Gates		75 tons
Volume of excavation—approximate		4,750 cu yds.
Volume of structural concrete—approximate		500 cu. yds.
RESERVOIR		
Area	224 acres	425 acres
Capacity—gross storage	6,300 acre ft.	24,200 acre ft.
Capacity—useful storage	3,000 acre ft.	7,500 acre ft.



First Colorado River water sweeps into canal Schedule 11, the last canal to be completed on the aqueduct and located just west of the Coxcomb tunnel.

AQUEDUCT HISTORY READY FOR EX-AQUEDUCKERS AND CITIZENS OF THE DISTRICT

In a notice issued by General Manager Weymouth on April 1 it is stated:

A paper-bound copy of the History and First Annual Report may be secured, without charge, by any District employee. In the Los Angeles office, requests for copies should be made at the information desk on the 11th floor. In the field requests should be made to superintendents or camp clerks.

Former employees of the District or of aqueduct contractors may obtain paper-bound copies of the report by making application in person or in writing to the Information Office, The Metropolitan Water District of Southern California, 306 West Third Street, Los Angeles, California.

Interested citizens and taxpayers of the District may also obtain the report, without charge, by making requests in writing or in person to the District. Only one copy of the report is available per person. Copies of the report cannot be made available to individuals for their distribution to groups of other persons.

A note from Washington, D. C., states that John Stearns, Division Engineer of Div. 3 during the heavy construction period, and now associated with the Federal Power Commission at the nation's capital, has recently been promoted from the position of Senior Engineer to that of Principal Engineer in the Division of Power-Flood Control Studies.

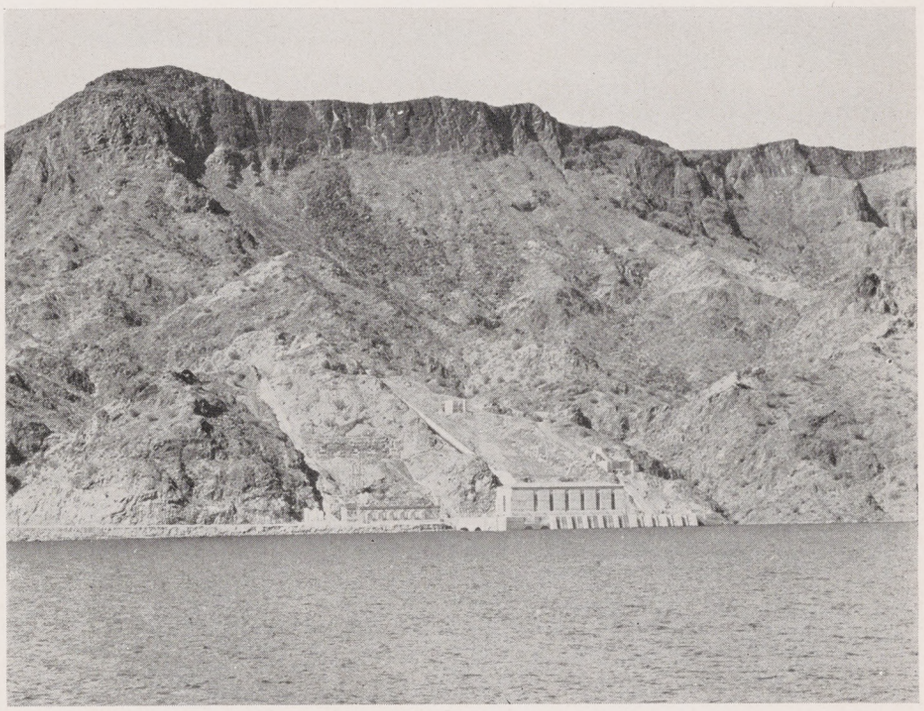
1939 Edition of "Prospectus" To Be Ready in May

The 1939 edition of COLORADO RIVER AQUEDUCT, edited by Assistant Chief Engineer Julian Hinds, and commonly referred to as the "prospectus" is now on the press, and is expected to be available early in May.

This interesting booklet, which is printed on heavy glossy paper 8½"x11", is made up of approximately 70 pages and contains a brief description of the construction of the aqueduct and the activities of the District as of March, 1939.

Containing many of the latest pictures of the aqueduct, the booklet is a revised edition of the "prospectus", the last issue of which was printed in 1937. COLORADO RIVER AQUEDUCT is not to be confused with "The History and First Annual Report of The Metropolitan Water District of Southern California" which was released early in April, 1939, and which is described elsewhere on this page.

In his new edition of the "prospectus", Mr. Hinds has called particular attention to the economic importance of the area which is included in The Metropolitan Water District. It is pointed out that 25 per cent of the population of the eleven western states now live in the Los Angeles metropolitan area, and that Los Angeles County ranks first among all the counties in the United States in the value of its agricultural products, in the manufacture of aircraft, and in the production of motion pictures.



The Intake pumping plant, which gives Colorado River water its first boost on the way to the 13 cities, is just an even 100 aqueduct miles east of the scene shown in the picture at the top of the page.

MONTHLY REPORT REVIEWS ACTIVITIES ALONG THE AQUEDUCT LINE

(EDITOR'S NOTE: The following is a brief summary of some of the activities of the District as set forth in the monthly report of General Manager F. E. Weymouth, filed with the Board of Directors in April, covering work done in March.)

Miscellaneous Activities Division

Due to construction work on the distribution division, employment in March showed an increase over that of February. During the month of March, 270 labor employment applicants were cleared for work on the aqueduct. Of this number nine were made available for force account work, and 261 were made available for aqueduct contractors. The net turnover for all positions for February, 1939, was 2.13 per cent as compared with 2.96 per cent for the same month in 1938.

Main Aqueduct

Safety Engineering—See safety award, third column this page.

Salvage Division—Based on appraised valuations, the amount placed on salvage division books during March, 1939, was $49,949. Sales either on bid or over the counter from the Banning salvage yard during March amounted to $63,480. Transfers to other District divisions or features amounted to $3,398. Total disbursements to date, including sales and transfers to other District features, amount to $514,819.

Construction—By use of two tractors, 650 acres in the Hayfield reservoir were cleared during March, making a total of 2,150 acres cleared at the end of the month. Consistently good progress was made in placing the concrete arch in the San Jacinto tunnel. The East Portal crew, using the continuous placing method, completed 6,437 feet, the best day's run being 273 feet on March 23. The West Portal crew, with a fixed length of 121 feet of forms, completed 3,423 feet. At the end of March there remained 15,633 feet, or 2.96 miles of arch to complete the lining of the San Jacinto tunnel.

Civil Engineering Division

Specifications—During March bids were opened on mechanical equipment for mixing and settling basins in the softening plant, and for 43,000 barrels of cement for the San Jacinto tunnel. Five sets of specifications were prepared during the month, including No. 306 for lime burning equipment for the water softening plant.

Design — As in the preceding month, the major activity of the Civil Design division was the design of the water softening plant. Plant layout was carried to a point where plans and specifications could be practically completed for valves, flow controllers, meters, and pumps; and considerable progress was made on the mechanical, architectural, and structural plans of all parts of the plant.

Materials—Deliveries of District furnished materials during the month included 65,000 barrels of cement, and 324 tons of reinforcement steel.

Statistical Records—The history and first annual report of the District was completed and the first copies received from the printer March 24. This is a 368-page illustrated volume giving account of the history, engineering studies and plans, the financing and construction of the Colorado River Aqueduct up to June 30, 1938.

Distribution Division

Field and Office Engineering—One field party was engaged for a short time making surveys along alternative locations for the Glendale-Burbank feeder. Additional studies were made in connection with the exchange of water with the City of Los Angeles for serving Beverly Hills and Santa Monica.

Construction—Clearing of the Cajalco reservoir site was continued, and the planting of trees and shrubs to prevent erosion and for the improvement of the site was completed. The contractor of the San Gabriel River spillway completed the installation of his construction plant early in March and by the end of the month had completed 83 feet of spillway tunnel.

Electrical Engineering Division

Main Aqueduct Pumping Plants—See story on page 2.

Purchasing Division

A total of 1,023 purchase orders was issued, covering purchases amounting to approximately $97,400. Carload forwardings for the month of March totaled 584.

Accounting and Costkeeping

The total cost of the work accomplished to March 31, 1939, was $176,435,830.

District Bond Interest Lowered

(*Continued from Page 3*)

ly six million dollars over the life of the bonds.

Another block of District bonds amounting to $73,556,000, which were also held by the R. F. C., likewise bear an interest rate of 4 per cent. This latter block of bonds was sold by the R. F. C. to a national syndicate of bond dealers in the latter part of 1938.

Interest Reduction Not All Fun

Although the saving to the District of approximately six million dollars, by the reduction in interest on a large block of bonds (see story page 3), was a source of great satisfaction to the Board of Directors and to the taxpayers of the M. W. D., the physical job of handling the vast number of bonds involved came close to being a headache for the Controller's Office, the Legal Division, the Treasurer's Office, and the Mails and Files Division.

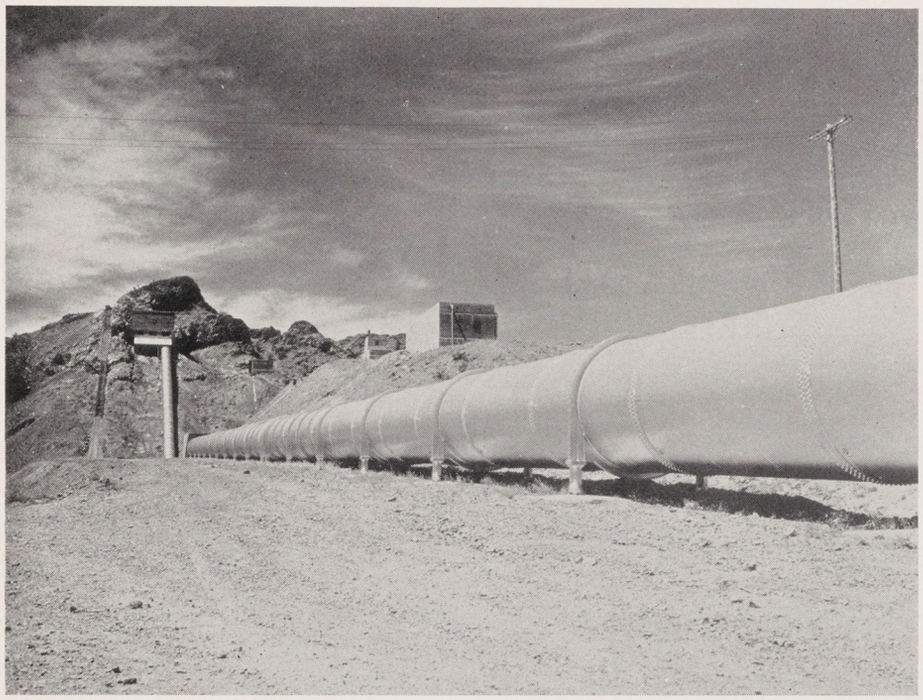
In the first place 16,992 bonds had to be reprinted and signed (those changed from interest rate of 4¼ per cent to 3½ per cent). The original bonds in this group then had to be carefully checked and cancelled, involving a double handling of each of these bonds.

In addition, the balance of the block of bonds, totaling 56,452 one-thousand dollar bonds had to have certain legal information imprinted on them. This required the use of seven addressograph machines, most of which were operated by District employes, and each of which handled bonds at the rate of 1000 per hour for more than eight hours.

Because each of the bonds represents $1000 in good money of the U. S. A., the handling of them had to be done in the vaults of the Federal Reserve Branch in Los Angeles, and the aqueduckers who handled the job worked under the watching eyes of an "army" of armed guards. These aqueduckers, who completed their job in record time, reported afterwards that they knew now how much privacy a goldfish does not have.

SAFETY AWARD

The lost-time accident frequency record for the San Jacinto tunnel work for the month of March was 39, and for the first three months of 1939 was 62. The safety flag for the lowest lost-time accident frequency record during March was awarded to the Potrero concreting forces.



The Gene delivery line which carries water up the second step between the river and the coastal plain.

District Pictures Seen By 100,000

Nearly 100,000 Southern California people have already seen the District's latest motion picture "The Thirteen Golden Cities", although it has only been generally shown since the first of the year.

A careful record of the showings of this sound picture indicates that it has thus far been exhibited at 166 schools with a total audience of 80,165, before 140 miscellaneous service clubs and similar organizations with a total audience of 13,421, and has been shown in six motion picture houses before an estimated audience of 6000.

On April 20, the District had on its books requests for future showings of the film before 50 schools and 25 clubs. The records indicate that as many as eight showings per day of the picture have been handled during recent weeks.

With the exception of the six theatre showings, all of the engagements have been handled by District employes of the Mails and Files Division under the supervision of Charles Brandt. These M. W. D. employes, who are expert motion picture projectionists along with their other duties, are: Vernon Glass, Jack Williams, Walter Parker, Arthur Vetch and Owen Brower.

Series of Aqueduct Broadcasts Started By CBS On April 10

(*Continued from Page* 3)

the western slope of America, Man is completing his biggest job . . . taming floods, moving rivers, creating lakes . . . winning a fight that makes the campaigns of history look like sham battles. Soon the job will be done, and a great aqueduct will be able to pour a billion gallons of water a day into populous cities 400 miles from its source.

"Within a few months this will be a job well done, and the noise of shovels, the boom of dynamite, the sounds of men and machinery and roaring construction camps will have echoed away down the corridors of memory.

"In this series of programs, the Columbia Broadcasting System brings you, right from the scene of action, sounds, voices, and descriptions of scenes that will never be heard again . . . important pages of history as they are being written, the chapter in the story of civilization titled WATER."

It seemed particularly appropriate that the series should start from the San Jacinto tunnel which has been a star performer on the airways since work was first started in 1933. The program on April 10 was the fifth, and last, of the radio broadcasts which have described the work of building that 13-mile tunnel and which have been heard by hundreds of thousands of people all over the United States and Canada.

Lunch time for the J. F. Shea Co. crew who are constructing the San Gabriel Canyon spillway on the distributing system. Extreme left is Hank Ewert, superintendent, and third from left is Lars Christiansen, M.W.D. inspector.

Two recent Spence Airphotos of the Iron Mountain (upper) and Eagle Mountain (lower) pumping plants which were placed in operation in April.

Cajalco Reservoir

Methods Used In The Construction of Cajalco Reservoir

By R. B. WARD
Formerly M. W. D. Resident Engineer at Cajalco Reservoir

Cajalco reservoir, the main storage unit of the Aqueduct distribution system, is situated between the terminus of the main aqueduct and the head of the distribution lines, about 60 miles easterly from Los Angeles. The purpose of this reservoir is to insure an ample supply of water near the points of use as a safeguard against interruptions of flow through the main aqueduct and to regulate the uniform flow of the aqueduct to meet the fluctuating demands on the distribution system.

In addition to the fact that the site at Cajalco was conveniently located and suitable for the economical creation of a reservoir, another factor influencing the selection of this site was that full development to 225,000 acre feet storage could be accomplished in stages.

The work of forming the reservoir for storing 100,000 acre feet of water was completed in February, 1938. This work was done under one general contract and involved the excavation and lining of a diversion tunnel and an outlet tunnel, the construction of two earthfill embankments, namely the main dam across Cajalco Creek and a dike on a low ridge along a portion of the northerly side of the reservoir, and the construction of a spillway and an outlet tower.

The diversion tunnel, which was used as a by-pass for storm water during the construction of the dam, is 9 feet in diameter, 2000 feet long, and lined with concrete having a minimum thickness of 8 inches.

The outlet tunnel through which water will pass to the distribution line is 14 feet in diameter and 2,348 feet long. Lining in the outlet tunnel consists of a welded steel membrane, backed with at least 8 inches of concrete and covered on the inside with a protective coating of 2 inches of gunite reinforced with welded steel mesh.

Cajalco dam and dike were constructed of earthy materials thoroughly compacted in layers 6 inches thick and have an 8-inch slab of reinforced concrete on the upstream slope for protection against erosion from wave action.

Before any materials could be placed in either of these embankments, considerable preparatory work was necessary. This work at the site of the dike consisted of clearing and grubbing all trees and other vegetation and then removing from the entire foundation area an average of about 3 feet of top soil material to be redeposited later. This material was not sufficiently dense in its natural state and would have afforded an easy path through which water might escape and possibly impair the safety of the structure. However, most of this material was suitable for use in the compacted embankment after it had been brought up to the proper moisture content. The depths to which it was necessary to take up this top soil material were determined by testing samples taken at various depths from open pit excavations put down at approximately 250-foot intervals over the entire foundation area. As the excavation progressed the depths of excavation were checked, and usually about 10 inches of the material was left on the foundation where it was compacted by rolling 16 times with the sheep's-foot rollers, the same as redeposited or borrow pit materials. About 250,000 cubic yards of materials was taken up and redeposited on the dike.

The work preparatory to placing material in the dam embankment was much more extensive than for the dike. First, there was the draining of Holmes Lower Lake; next, the removal and wasting of about 27,000 cubic yards of muck from the lake bed; then the removal to bed rock of the remainder of the lake bed material which ranged from 5 to 18 feet in thickness. Considerable of this latter material was suitable for use in the compacted embankment but some of it contained rocks in quantities and sizes that would interfere with the compacting action of the sheep's-foot rollers. The rocky material was passed over grizzly bars spaced 4 inches apart, and the rocks were then deposited in the pervious section of the dam and the fines were compacted in the rolled section.

Excavation for dam foundation in areas other than the lake bed portion consisted of the removal of material to a depth of 4 to 65 feet. This removal was accomplished principally with shovels and trucks, but where depth of cut was small and the surface of the abutments was reasonably uniform, tractors equipped with bulldozers pushed the material down hill into piles where it was picked up by shovels and loaded into trucks, then hauled to the grizzly or redeposited directly on the embankment in either the rolled or the pervious section.

In order to utilize to the best advantage of the District those materials excavated from the dam foundation, 552,000 cubic yards, and also those from the spillway channel, 124,000 cubic yards, it was necessary for an inspector to be present at all times directing the disposition of each truck load. From an economical standpoint, proper utilization and disposition of these materials was one of the most important problems in connection with the construction of Cajalco Dam because every cubic yard of earth removed from the dam foundation or spillway channel and used in the rolled fill embankment of the dam meant a direct saving to the District, as such use reduced the amount of material which had to be obtained from borrow pits or quarries at considerably higher unit prices.

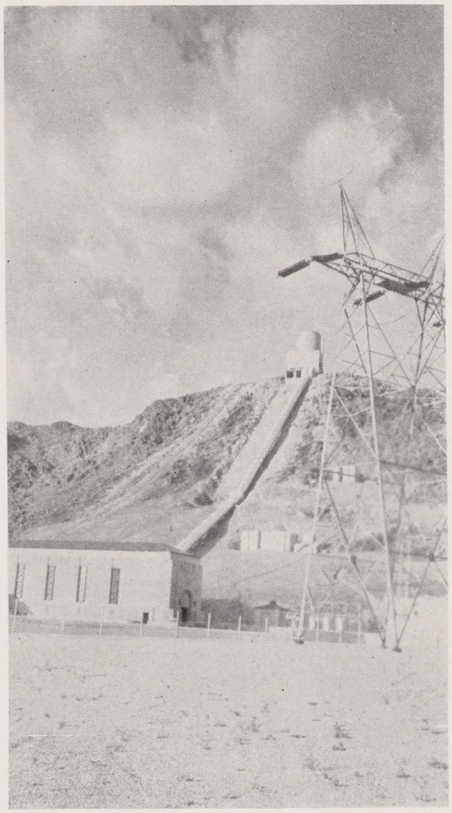
Material placed in the embankments other than that obtained from parts of required excavation, was hauled one-half to two and one-half miles from borrow pits located within the reservoir. Excavation in the pits was usually accomplished by four 2½-cubic yard shovels and hauling was done by a fleet of thirty 10-cubic yard trucks equipped with pneumatic tires and using butane fuel.

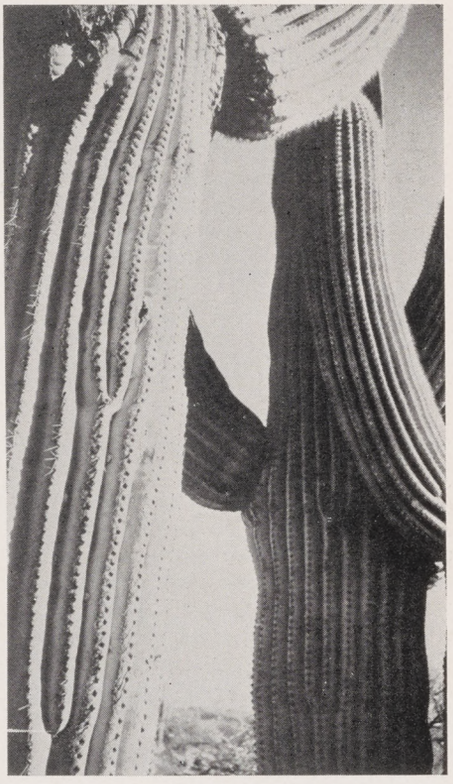
In general, compaction of the material in the embankments was effected by six 30,000-pound sheep's-foot rollers drawn by tractors. Usually 16 roller trips over each 6-inch layer were necessary to obtain the desired compaction. On parts of the embankment inaccessible to the roller units, pneumatic tools or Barco tampers were used to compact the material.

In order to obtain the desired compaction in the embankment it was essential that the materials contain the proper amount of moisture. The materials were all too dry in their natural condition to use in the embankments and were brought up to approximately the proper moisture content in the borrow pits prior to excavation by means of overhead sprinklers or by flooding small diked areas. Tests for moisture were made prior to any wetting in the pits and after each wetting; on the subgrade of each layer in the embankment; and after the material had been dumped and spread. Any deficiency in moisture was made up through hoses during excavation and also by sprinkler trucks on the embankment.

Results of the moisture control and compaction were determined by density or unit weight tests. These tests were made at the rate of one to approximately each 1700 cubic yards compacted. The average dry weight of the compacted material in the dam and dike was found to be 126.3 and 121.9 pounds per cubic foot respectively. The effectiveness of the compaction methods employed is indicated by the small amount of settlement which has occurred in the fills.

(*Continued on Page* 12)





These very interesting pictures of saguaro cactus and of the Eagle Mountain Pumping Plant were made on recent trips to the desert by M.W.D. engineer R. W. Spencer, assistant to the Office Engineer of the District.

FIRST WATER FLOWS INTO HAYFIELD RESERVOIR APRIL 12

(*Continued from Page 2*)

well known landmarks during the height of the construction period a few years ago.

Among these features are the Whipple Mountain tunnel, the Freda Siphon, all of the canal schedules, and the Iron Mountain, Coxcomb, and Eagle Mountain tunnels.

Large Group of Engineers Visit Pumping Plants

Guided by M. W. D. Chief Electrical Engineer J. M. Gaylord, more than 70 members of the Los Angeles Section of the American Institute of Electrical Engineers inspected the Metropolitan Aqueduct pumping plants over the week-end of April 22-23.

Headed by Mr. David Hall, chairman of the Los Angeles section of the institute, the electrical engineers, most of whom are from the metropolitan area, visited the Eagle Mountain plant on Saturday and spent that evening and Sunday morning at Division 1 headquarters where they inspected the Intake and Gene plants.

In order to present a clear picture to the group as to what it was seeing, District Engineers Tom Walsh, B. H. Martin and Gene Falkenberg gave brief lectures on the various phases of the construction and operation of the plants.

Mr. Gaylord is Secretary-Treasurer of the local section of the AIEE which holds the same position for electrical engineers as does the American Society of Civil Engineers for engineers in that branch of the profession.

	LOS ANGELES	BANNING	INDIO	HAYFIELD	EAGLE	DESERT CENTER	IRON	RICE	VIDAL ROAD	EARP	GENE
LOS ANGELES	-	85	128	167	184	179	217	228	247	263	281
BANNING	85	-	43	82	99	94	132	143	162	178	196
INDIO	128	43	-	39	56	51	89	100	119	135	153
HAYFIELD	167	82	39	-	23	18	56	67	86	102	120
EAGLE	184	99	56	23	-	10	48	59	78	94	112
DESERT CENTER	179	94	51	18	10	-	38	49	68	84	102
IRON	217	132	89	56	48	38	-	20	39	55	73
RICE	228	143	100	67	59	49	20	-	19	35	53
VIDAL ROAD	247	162	119	86	78	68	39	19	-	16	34
EARP	263	178	135	102	94	84	55	35	16	-	18
GENE	281	196	153	120	112	102	73	53	34	18	-

MILEAGES OF THE BRANCH ROADS TO PUMPING PLANTS ARE INCLUDED IN THE ABOVE.

The above mileage chart, compiled by engineers in the Electrical Division, indicates the shortest highway distances to the aqueduct pumping plants (Intake considered with Gene) from Los Angeles and way points.

NEWS FROM FIELD AND OFFICE

This pipe smoking individual is John Luther, District inspector on the San Jacinto tunnel (Potrero shaft) who has been with the M.W.D. since 1933.

Much to the consternation of the Distribution Division, W. F. "Mac" McCleary, Distribution inspector who has been on the Cajalco Reservoir job since it was first started, has gone highbrow. It all came about when "Mac" sent in an order for various types of flora and fauna to be used in landscaping the Cajalco site. Following is a sample of a few items that "Mac" requested: "Jasmium Primulimum; Photinia Grbulfalia; Parkinsonia Aculcata; Lcptaspcrum Laeuigatum; etc., etc." The burning question before the house now is: Does "Mac" really know what all the fancy latin means, or was he afraid to come right out and ask for some sweet scented lilacs, some daisies, and some petunias? At any rate, "Mac" got the flowers, they're planted and growing, and visitors can now have the unqualified thrill of seeing a former hardboiled construction inspector strolling among the Nerium, the Acacia Floribunda, etc., etc., and calling each one by its proper name (?).

* * * *

A list of recent transfers of M.W.D. employees includes: General Foreman Jack Schweer from Eagle and Hayfield to Intake and Gene pumping plants; Dan P. Gabele, pumping plant operator, from Iron Mountain to the Eagle and Hayfield plants; Electrician O. B. Danford from Cabazon (San Jacinto tunnel) to pumping plant operator at Iron Mountain; Engineer N. H. Beaton, from the Electrical-Mechanical Division to the Design Division; also from Electrical-Mechanical to the Design Division was Engineer Verne Elliott.

Aqueduct Temperatures

March 15 to April 15, 1939

	Max.	Min.
Div. 1	95°	45°
Div. 2	93°	45°
Div. 3	94°	46°
Div. 5	87°	37°

* * * *

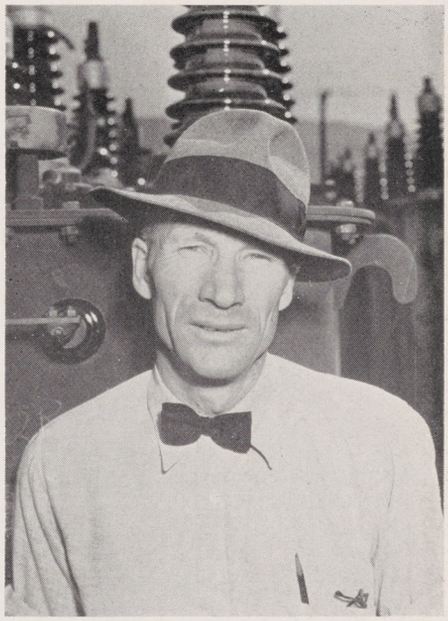
A case of unexpected prominence was brought to the attention of the aqueduct clan on April 7 (possibly due to the fact that the day before was Army Day) when the Los Angeles Southwest Wave carried a story stating that "Colonel" R. Le Baron was to speak before the Los Angeles Realty Board on the subject of The Metropolitan Water District. Although the members of the Right-of-Way Division have always paid strict attention when Right-of-Way Agent George R. Le Baron had something to say, it is now reported that the office personnel have taken to wearing Sam Browne belts accompanied by snappy saluting as is proper when Colonels are in the offing. A later dispatch from the R-of-W headquarters states that on April 18 the "Colonel" passed cigars and candy in celebration of the arrival of his first grandchild—Carol Ann Crane—the daughter of one of Mr. Le Baron's daughters.

* * * *

Reports from the eastern end of the aqueduct state that the relocation of the District road from Earp to Parker Dam, caused by the construction of the Indian Service Headgate Dam on the Colorado River, has now been completed. The reports also state that during the first months of 1939 an average of 1000 tourists per week have been visiting Parker Dam. It is interesting to note that in a recent article in the Saturday Evening Post, Garet Garrett described this structure as "the most beautiful dam in the world."

* * * *

Former aqueduckers, as indicated on the records of the District's personnel files, are now scattered all over the world holding down important jobs and are adding to the reputations that they gained on the construction of the aqueduct.



Another chap who has also been on the job since 1933 is Alan Greenhalgh, chief clerk for the Operating Division. Alan, who is married and has four sons, started to work for the District on the construction of Pushawalla Camp.

Another aqueducker who has gone completely berserk is one Jack C. Williams. At 12:30 A. M. on the morning of April 21, Mr. Williams put on rose-colored glasses, began walking on the clouds and talking to himself—all because at that hour and date there arrived in this world Jack C. Williams, Jr., weight 6 pounds flat. Jack normally operates the supply room in the basement of the L. A. office, but for the next few days his customers may expect to find him floating right outside the windows of any one of the twelve stories of the headquarters building.

* * * *

The vital statistics column also indicates that on April 4, Philip Wilson MacMillan, weight 7 pounds, 11 ounces, arrived in the household of W. W. MacMillan. Papa, who by now has had time to get his feet back on the ground, is a well known member of the Distribution Division.

* * * *

Mr. Hiram W. Wadsworth, civic leader of Pasadena, died on April 12 at the age of 76. During the period 1924-1929, Mr. Wadsworth was president of the Colorado River Aqueduct Association, a pioneer group in advancing the cause of the aqueduct.

Early Development Of Parker Dam Power Planned

At its meeting on April 7, the District's Board of Directors authorized General Manager Weymouth to sign a proposed contract with the Federal Government which will probably result in the construction of a power plant at Parker Dam in the near future.

Secretary of the Interior Harold L. Ickes recently announced that a tentative agreement had been reached with the Salt River Valley Water Users' Association and the Central Arizona Light and Power Company, by which power can be supplied from Boulder and Parker dams to meet a critical power shortage expected to develop this year in central Arizona because of a shortage in water supply.

Under this agreement the Bureau of Reclamation, with the Federal Government advancing all necessary funds, will immediately develop the Parker power site and build a transmission line from Parker Dam to Phoenix. The two power customers are each to receive a maximum of 25,000 kw, the minimum annual payment for each customer to be $220,000.

The Gila irrigation pumping project is now under construction by the Bureau of Reclamation and will shortly require power to the extent of 10,000 to 25,000 kw for its operation. It is therefore proposed to install three of the four 25,000 kw generating units at the Parker site, one unit for the Gila project and two for the Arizona power load.

The cooperative contract under which Parker Dam was built allots one half of the power privilege at the dam to the Government and the other half to the Metropolitan Water District. Since the Government's half of the power privilege at Parker Dam is insufficient to supply the Gila project and the Phoenix loads, it will be necessary to install one, and perhaps both, of the District's units in the power plant. The tentative contract between the United States and the District would permit the Government to use the space in the plant reserved for the M.W.D. units and would give the District a share of the revenue from the sale of the power developed. Under this contract the Government would furnish all necessary funds for construction and operation.

In the immediate future it is proposed that one District unit and one Government unit will be used to supply the Arizona power customers and the income from the energy sales will be divided equally between the M.W.D. and the United States. It is estimated that credits accruing to the District from the sale of power will amortize the entire cost of the District's part of the Parker power plant, and will also pay approximately $2,795,000 toward the cost of power which the District is obtaining at the Boulder power plant.

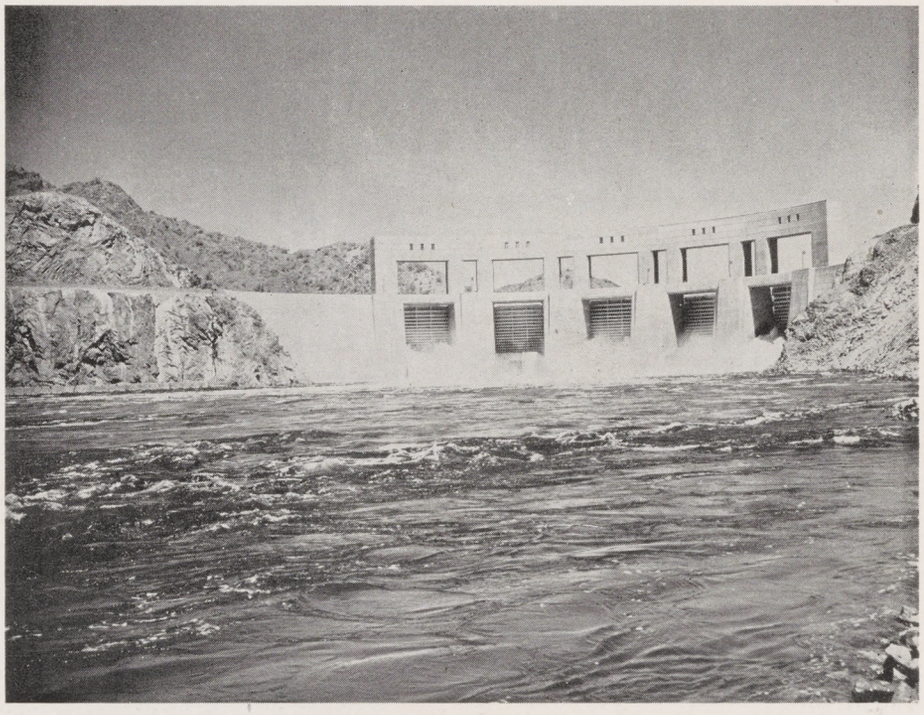
The District units in the Parker plant ultimately will be needed to supply power for Aqueduct pumping. The contract provides that the District can withdraw its units for its own use after 10 years from the date when power is first delivered to Phoenix upon paying that portion of the District's costs which remain unamortized at the time of withdrawal.

The fourth unit in the Parker plant will later be required to supply the Phoenix market if the estimated growth in that area is realized. In such a case, the District will be credited with two-thirds of the revenue derived from the sale of power.

The Parker power plant cannot be completed before 1940, and in the meantime it is proposed to supply the immediate needs of the Arizona power load by transmitting some of the District's unused Boulder energy over the District's transmission line to Parker Dam and thence over the line to be built by the Government to Phoenix. Under the proposed contract the District will receive an additional credit from the sale of this energy.

Parker Dam, an integral part of the Colorado River Aqueduct system, was constructed by the Government with funds supplied by The Metropolitan Water District. The forebay and powerhouse substructure for the proposed power plant were built during the time that the dam proper was being constructed.

The estimated cost for the proposed power development totals $8,305,000. This figure includes the power plant, the transmission line to Phoenix and substation, but does not include the cost of the line to the Gila project.



A downstream view of Parker Dam from the Arizona side of the Colorado River. Water stored behind the dam may soon be used to generate power at a proposed plant to be constructed in the near future.

Cajalco Reservoir

(*Continued from Page* 9)

The maximum settlement which has taken place in the dike is 0.10 feet and in the dam is 0.23 feet.

Means of releasing water from the reservoir into the distribution system was provided by the construction of a reinforced concrete outlet tower, connected directly to the outlet tunnel. The tower is circular in shape, 20 feet inside diameter and 145 feet high. Fifty control valves were installed in the tower at six different levels. These valves are double disc type, 30 inches in diameter and hydraulically operated.